



SILVERTOWN TUNNEL

DOCUMENT TITLE:

Flood Warning and Evacuation Plan

DOCUMENT NUMBER:

ST150030-RLC-ZZZ-ZZ-ZY-PLN-EN-0001

Asite Task ID: STT-DCO-0ZZ.12.9.2.11

PURPOSE OF ISSUE	For Acceptance	DOCUMENT SUITABILITY	S3 - For Review & Comment	TOTAL PAGES (Including this page)	23
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Prepared by	Checked by	Approved by	Date	Revision
 CJV Consents Coordinator	 CJV Environmental Manager	 CJV Consents Manager	08/07/2020	P04

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ST150030-RLC-ZZZ-ZZ-ZY-PLN-EN-0001

Revision P04

08/07/2020

Issue and Revision Control

Distribution and revision control is managed through the Electronic Document Management System – ASITE, with the latest revision displayed.

Document uncontrolled when printed.

Revision History			
Rev No	Date	Summary of Changes	Section & Number
P01	09/04/2020	First Issue	
P02	29/04/2020	Amendments following TfL comments & restructuring of document	All
P03	04/06/2020	Amendments following RBG and EA comments	3.2
P04	08/07/2020	Amendments to further TfL comments and PLA consultation comments	2.1, 3.3

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List of Abbreviations

ABD	Area Benefitting from Defences
AEP	Annual Exceedance Probability
ES	Environmental Statement
FRA	Flood Risk Assessment
FWEP	Flood Warning and Evacuation Plan
FZ	Flood Zone
ha	Hectares
m	Metres
NGR	National Grid Reference
NN NPS	National Road and Rail Networks: National Policy Statement
TfL	Transport for London

1. Overview

1.1 Introduction

The Silvertown Tunnel (STT) scheme involves the construction of a twin bore road tunnel providing a new connection between the A102 Blackwall Tunnel Approach on the Greenwich Peninsula (Royal Borough of Greenwich) and the Tidal Basin roundabout junction on the A1020 Lower Lea Crossing / Silvertown Way (London Borough of Newham). The project was formally granted development consent through a Development Consent Order (DCO) issued by the Department of Transport in May 2018. STT will be approximately 1.4km long and able to accommodate large vehicles including double-decker buses. It will include a dedicated bus, coach and goods vehicle lane, enabling TfL to provide additional cross-river bus routes. The scheme also includes the introduction of free-flow user charging on both the Blackwall Tunnel (northern portal located in London Borough of Tower Hamlets) and the new Silvertown Tunnel.

Transport for London (TfL) have entered into a Project Agreement with the Project Company Riverlinx (Project Co) who are responsible for the detailed design, construction, financing and maintenance of the tunnel and supporting infrastructure. A 5 year period of design and construction will be followed by a further 25 years of operation and maintenance. The Project Co has appointed Riverlinx CJV as the Design and Construction (D&C) Contractor responsible for undertaking the detailed design and construction of the STT scheme all in accordance with the constraints and parameters of the Development Consent Order (DCO), TfL specifications and other commitments made by TfL to stakeholders. Riverlinx CJV is a joint venture formed between Ferrovial Agroman (UK) Ltd, BAM Nuttall and SK Engineering and Construction Co Ltd.

1.2 Purpose

This Flood Warning and Evacuation Plan (FWEP), produced by RiverLinx CJV, contains information on flood emergency response actions for the period of design and construction only, and not the operational phase of STT which will be the responsibility of Project Co. The FWEP has been informed by a Flood Risk Assessment (FRA) previously produced to support the STT Environmental Statement (Appendix 16.A (Document Reference: 6.3.16.1)). The National Road and Rail Networks National Policy Statement (NN NPS), paragraphs 5.92 and 5.93 require that projects in Flood Zones (FZs) 2 and 3, such as STT, should be accompanied by an FRA that identifies and assesses the risks of all forms of flooding to and from the project and demonstrate how these risks will be managed. This FWEP represents one of the flood risk management tools to be adopted for STT.

The key aim of the FWEP is to illustrate clear indicators confirming how CJV will react in the event of both potential and actual flood events during the design and construction phase of STT. This includes when the worksites will need to be evacuated in the unlikely event of a flood emergency and key information for planning and responding to an evacuation. For the purpose of the FWEP the area surrounding the future northern portal of STT equates to the area referred to as the Silvertown worksite (located in the London Borough of Newham) during construction. The area surrounding the future southern portal of STT equates to the areas referred to as the Greenwich worksite (located in the Royal Borough of Greenwich) during construction.

Flood risk is a product of both the likelihood and consequence of flooding; throughout this plan, flood events are defined according to their likelihood of occurrence. Floods are described according to an 'annual chance', meaning the chance of a flood occurring in any one year. This is directly linked to the probability of a flood. For example, a flood with an annual chance of 1 in 100 (a 1 in 100 chance of occurring in any one year on average), has an Annual Exceedance Probability (AEP) of 1%.

1.3 Location

STT and nearby watercourses, the River Thames and Bow Creek, are depicted in Figure 1 below. The Order Limits encloses of an area of approximately 42 hectares (ha) of land which includes the operational tunnel and temporary construction worksite areas to the north (London Borough of Newham) and south (Royal Borough of Greenwich) of the tunnel.

Figure 1



Based on the Environment Agency Flood map (see Appendix A), the southern portal (Royal Borough of Greenwich) is located wholly within Flood Zone 3, in the 1 in 200-year floodplain of the River Thames. Much of the northern portal (London Borough of Newham) is also located in Flood Zone 3, but a small area is located in Flood Zone 2, in the 1 in 1000-year floodplain. Both the northern and southern portals are classed as being in an 'Area Benefitting from Defences' (ABD), which reduce the actual flood risk to the STT. Existing defences provide a standard of protection in excess of 1 in 1000. However, the predicted effects of climate change are such that over the development lifetime, if policies set out in the Thames Estuary 2100 Plan are not implemented, this standard of protection will diminish and there is potential for overtopping and increased risk of defence failure (breach).

1.4 Flood Risk

The main source of flood risk to STT is a residual risk associated with a breach (failure) of existing river defences in combination with extreme tide levels. Bespoke breach modelling of the Thames defences was

undertaken during the development of the Environment Statement with the aim of quantifying flood conditions within the application boundary in a breach scenario.

The modelling study considered a breach in the northern bank of the Thames (London Borough of Newham) at a location just south of Bell Lane (National Grid Reference (NGR) 539930 180170) as agreed with the Environment Agency. This area relates to the Silvertown worksite. The baseline (without STT) and post development scenarios were represented in the ground terrain element of the model and the 0.5% AEP (1 in 200) tidal flood event was simulated for three-time horizons: 2005, 2065 and 2115, incorporating appropriate allowance for climate change. The results are summarised in Table 1 below and full details are provided in the FRA (Appendix 16.A of the Environmental Statement).

Table 1 – Northern Portal (London Borough of Newham) / Silvertown worksite – Summary of Breach Modelling Results

Modelled Scenario	Summary of Baseline Flood Risk to the Scheme	Flood Risk to the Scheme and Impacts beyond the Application Boundary
2005	No flooding within the application boundary.	No flood risk to the Scheme and no impact on baseline floodwater depths or extents, either within or beyond the Order Limits.
2065	Flooding would occur within south eastern parts of the application boundary with floodwater depths ranging from 0.01m to 0.55m. However, these areas are for use during the construction phase only and no areas within the operational boundary are at residual flood risk.	No flood risk to the operational boundary. Minor increase (0.01m) in baseline floodwater depths in some construction work sites. On third party land max increases of 0.02m predicted, with max baseline flood level reductions of 0.02m in other areas.
2115	Flooding would occur within south eastern parts of the application boundary with floodwater depths ranging to a max of 0.8m. However, these areas are for use during the construction phase only and no areas within the operational boundary are at residual flood risk.	No flood risk to the operational boundary. Minor increase (0.01-0.05m) in baseline floodwater depths on some land to be acquired during the construction phase. On third party land max increases of 0.05m area predicted, with baseline flood level reductions of up to 0.07m in other areas.

The model concluded that land within the operational boundary on the northern side (London Borough of Newham) of the River Thames is not at residual risk of flooding should defences fail (breach) in the location that has been modelled. This location was selected on the basis that it is most vulnerable to breach. It is also concluded that construction of STT will have no significant impacts on residual flood risk to third party land.

Two breach locations were modelled on the southern bank (Royal Borough of Greenwich) of the River Thames (breach location 1 and breach location 2). These locations, just north of Anchor and Hope Lane (NGR 539930 180170) and off Morden Wharf Road (NGR 539100, 178970) were also agreed with the Environment Agency and the results of the baseline and post development model runs for the three-time horizons considered are summarised in Table 2 and Table 3. This area relates to the Greenwich worksite

Table 2 - Southern Portal (Royal Borough of Greenwich) / Greenwich worksite Breach Location 1 – Summary of Breach Modelling Results

Modelled Scenario	Summary of Baseline Flood Risk	Flood Risk to the Scheme and Impacts beyond the Application Boundary
2005	No flooding within the application boundary.	No flood risk to STT and no impact on baseline floodwater depths or extents, either within or beyond the application boundary.
2065	The vast majority of the site is predicted to be flood free during this event, with model results indicating shallow depths of floodwater (up to 0.3m) on one very small area.	No flood risk to the operational boundary and there is very little change to baseline flood depths/extents, with baseline levels generally varying between +0.1m and -0.1m within and beyond the application boundary.
2115	The majority of the site would be flood free during this event. Some flooding along boundary with the A102, to depths of 0.01m to 0.7m.	Flooding around the southern tunnel entrance is predicted. On third party land, flooding no longer occurs along the northern section of the A102 and baseline flood levels are reduced along the remainder of the A102.

Table 3 - Southern Portal (Royal Borough of Greenwich) /Greenwich worksite Breach Location 2 – Summary of Breach Modelling Results

Modelled Scenario	Summary of Baseline Flood Risk	Flood Risk to the Scheme and Impacts beyond the Application Boundary
2005	No flooding within the application boundary.	No flood risk to STT and no impact on baseline floodwater depths or extents, either within or beyond the application boundary.

2065	Flooding along the A102 and Pavilion Lane is predicted. Floodwater depths range to approximately 0.6m.	Flooding around the southern tunnel entrance is predicted, with depths exceeding 1m. Elsewhere there are reductions in baseline floodwater levels and extents, particularly along the A102.
2115	Flooding along the A102, Pavilion Lane and Boord Street is predicted in this scenario. Floodwater depths range to approximately 0.8m.	Flooding around the southern tunnel entrance is predicted, with depths exceeding 2m. Elsewhere there are reductions in baseline floodwater levels and extents, particularly along the A102.

Future maintenance of the southern defences is therefore more critical to reducing residual flood risk in the operational phase of STT. In order to manage residual flood risk the FWEP has been developed to ensure the preparedness, in the event of a flood emergency, of construction personnel and during the design and construction phase. Riverlinx, as the operator of STT will address any aspects relevant to the operational phase of STT.

2. Key Information

2.1 Pre-Occupation Actions

Riverlinx CJV will ensure that all actions outlined in Table 4 are completed prior to the commencement of construction of STT. A completion date and signature in the table will mark the following actions as complete. When the construction phase is complete, Riverlinx CJV's responsibilities end and it will be the responsibility of Riverlinx (Project Co) to ensure that all actions are updated and completed as required.

Table 4 – Pre-Occupation Actions

No.	Action	Further Information	Completion Date and Signature
1	Undertake a review of the Flood Warning and Evacuation Plan and make updates to take into account new or additional information.		02/04/2020 [Redacted Signature]
2	Register with the Environment Agency Floodline Warnings Direct Scheme.	Registration with Floodline Warnings Direct can be made using the following link https://fwd.environment-agency.gov.uk/app/olr/register or by calling Floodline on 0345 988 1188	02/04/2020 [Redacted Signature]
3	Ensure construction personnel are aware of the Flood Warning and Evacuation Plan and are trained sufficiently to implement the procedures set out in the Plan.		
4	Develop an emergency access and egress plan for the bored tunnelling works sites, including details on a response plan to breaches of the tunnel during construction.	During site inductions, all staff will need to be made aware of the emergency access and egress arrangements.	
5	Identify an appropriate designated evacuation point from both the Silvertown and Greenwich worksites.	Designated sites should be located on public land within Flood Zone 1.	05/05/2020 [Redacted Signature]

2.2 Roles and Responsibilities

Table 5 lists contact numbers for personnel and relevant statutory undertakers that have key roles during a flooding emergency during the design and construction phase of STT. Once construction is complete this table should be updated by Riverlinx (Project Co) and TfL to reflect those responsible during the operational of STT.

Table 5 – Key Personnel and their Contact Numbers

Title	Name	Role	Contact Number
CJV Construction Director	[REDACTED]	Ensure that the FWEP has been put in place. Ensure sufficient resources are provided to implement the Plan.	[REDACTED]
Project Managers	[REDACTED]	Ensure all Pre-Occupation Actions (Table 4) have been completed as well as to ensure that the FWEP is reviewed and updated annually or upon any significant changes that would affect the adherence to the FWEP.	[REDACTED]
Site Agents	[REDACTED]	<p>To direct all FWEP actions for site-based personnel and operations in adherence with the flood management and evacuation procedures in Table 11 including notifying staff of flood alerts, flood warnings and severe flood warnings.</p> <p>Direct the evacuation of the worksites and help other members of staff to move to the designated evacuation points located in Flood Zone 1 (See Section 3.5). Ensure all staff are accounted for during an emergency event and then provide an update to any on-site emergency services confirming that the site has been evacuated.</p>	[REDACTED]
Environment Agency Floodline	N/A	The Environment Agency will issue a flood warning to TfL Project Team Manager, and the CJV Construction Director.	[REDACTED]

2.4 Training

Riverlinx CJV will ensure that all named persons and site supervisors are briefed on the procedures for evacuation contained within the FWEP. The training for construction personnel would, as a minimum, cover:

- requirements of the FWEP;
- confirmation of named roles, clearly identifying positions held, responsibilities, communication and chain of command;
- staff duties;
- evacuation routes;
- staff safety during a flood event;

- electrical systems emergency shut off procedures;
- all construction staff shall be trained as part of the site induction process
- all staff shall be re-trained annually
- flood management and evacuation drills should be conducted annually.

2.5 Emergency Services

In an emergency, where there is a real and immediate threat to life or property, the first point of contact will be 999. Table 6 below provides contact numbers for non-emergency matters.

Table 6 – Contact Numbers for Emergency Services

Body	Contact Number
London Fire and Rescue Service	020 8555 1200
Police (non-emergencies)	101
Environment Agency	0345 988 1188

If medical attention is required within the workplace, First Aiders should be in attendance and a record of the individual affected and the circumstances relating to the incident should be kept.

The closest hospital with an Accident and Emergency Department to the Silvertown worksite is Newham University Hospital. The Hospital can be contacted on 020 7476 4000, the address is: Newham University Hospital, Glen Road, Plaistow, London, E13 8SL.

The closest hospital with an Accident and Emergency Department to the Greenwich worksite is Queen Elizabeth Hospital. The Hospital can be contacted on 020 8836 6000, the address is: Queen Elizabeth Hospital, Stadium Road, London, SE18 4QH.

Table 7 provides a list of other useful numbers for the Silvertown worksite.

Table 7 – Other Useful Contact Numbers – Silvertown

Body	Name	Contact Number
Electricity Provider	UKPN (Emergencies)	0800 316 3105
Gas Provider	Cadent Gas (Non-Emergencies)	0345 835 1111
	Indigo Pipelines (Non-Emergencies)	0345 078 6739
	National Gas Emergency Services Number	0800 111 9999
Water Company	Thames Water	0800 980 8800
Telephone / Telecoms Provider	Virgin Media	0345 454 1111
	BSkyB (GTT Interoute)	0115 983 6200
	BT Openreach	0800 023 2023
	Vodafone	0333 304 0191
	Colt	0207 390 3900
	Zayo	0207 220 3800
Local Authority	Tata	0207 235 8281
	London Borough of Newham	020 8430 2000

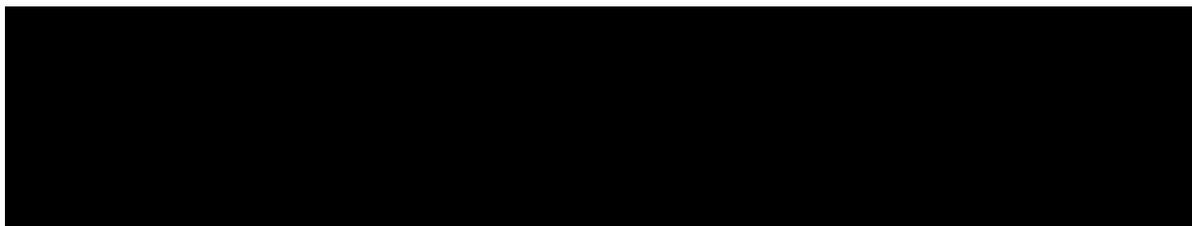
Table 8 provides a list of other useful numbers for the Greenwich worksite.

Table 8 – Other Useful Contact Numbers – Greenwich

Body	Name	Contact Number
Electricity Provider	UKPN (Emergencies)	0800 316 3105
	LUL Power	0800 316 3105
Gas Provider	SGN (Non-Emergencies)	0800 912 1700
	GTC (Non-Emergencies)	0135 924 0363
	National Gas Emergency Service Number	0800 111 9999
Water Company	Thames Water	0800 980 8800
Telephone / Telecoms Provider	Virgin Media	0345 454 1111
	BT Openreach	0800 023 2023
Local Authority	Royal Borough of Greenwich	020 8854 8888

2.6 Insurance Details

Table 9 provides the details of the insurer for Riverlinx CJV.



2.7 Location of Services

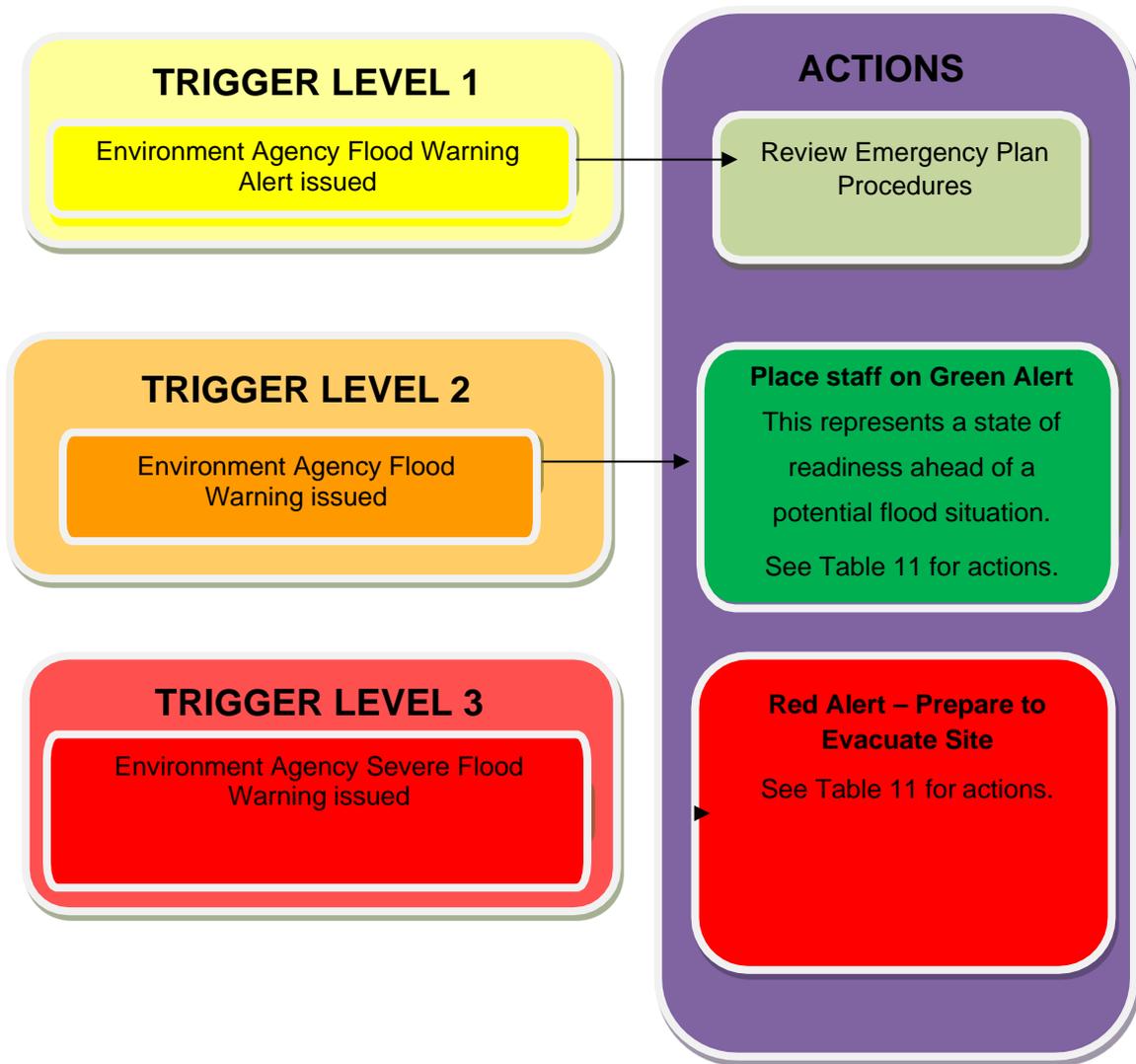
When confirmed, Riverlinx CJV will ensure that the location of service cut-off switches and valves will be effectively communicated to all relevant personnel in case of a flood incident. This will only be actioned if safe to do so by the relevant Project Manager in the event the site is evacuated.

3. Flood Management and Evacuation

3.1 Overview

An overview of the FWEP procedures is shown in Figure 2. This figure shows the three trigger levels and the corresponding actions that will need to be implemented.

Figure 2 – Flood Management and Evacuation Procedures



3.2 Environment Agency Flood Warning Service

All of those Riverlinx CJV personnel named in Table 5, as a minimum, will sign up to the Environment Agency’s flood warning service so that when the Environment Agency issues a flood alert or warning, the service would send an automated warning message to all registered to the service. The following Environment Agency Flood Alerts are applicable to STT;

- The Lower River Lea from West Ham to Canning Town (Silvertown)
- Tidal Thames from Beckton Sewage Works to the River Lea (Silvertown)
- Tidal Thames from Woolwich Arsenal to Deptford Creek (Greenwich)

- Tidal Thames in the boroughs of Bexley and Greenwich (Greenwich)
- Groundwater flooding in South East London (Greenwich)

Environment Agency Flood Warnings are to be used to set evacuation triggers. Three Environment Agency Flood Warning levels; Flood Alert, Flood Warning, Severe Flood Warning, correspond to action levels as part of the CJV response; Review Plans, Site Readiness (Green Alert) and Preparation for Site Evacuation (Red Alert).

It should be noted that both the Silvertown and Greenwich worksites are situated in a larger geographical area where the Environment Agency provides a general early Flood Alert notification for possible flooding. Therefore, the Flood Alert may not specifically apply to the site itself and its immediate neighbourhood.

In addition, both worksites fall within areas benefitting from flood defences so it may be the case that a Severe Flood Warning in the areas listed above may not impact upon STT as it might do other locations within the alert areas not benefitting from flood defences.

In the event an actual flood event occurring in either a scenario where no Environment Agency notifications were disseminated or where CJV personnel have failed to enact the correct responses to each level of flood warning notification, the actions against “**Actual Flood Event/River Wall Breach**” in Table 11 will followed.

Table 10 provides guidance to residential and business premises of actions to take should a flood alert or flood warning be issued in the area in which they are located. Given the nature of a large construction site differs to that of residential or business premises the guidance has been considered and amended to suit the different context.

Table 10 – Environment Agency Flood Warnings

Symbol	Risk	Status	When it is used	What to do
	High Risk	Severe Flood Warning Severe flooding. Danger to life.	When flooding poses a significant threat to life.	-Stay in a safe place with a means of escape. -Be ready should you need to evacuate. -Co-operate with the emergency services. -Call 999 if you are in immediate danger.
	Medium Risk	Flood Warning Flooding is expected. Immediate action required.	Half an hour to one day in advance of flooding.	-Turn off gas, electricity and water supplies if safe to do so. -Put flood protection equipment in place.

	Low Risk	Flood Alert Flooding is possible. Be prepared.	Two hours to two days in advance of flooding.	-Be prepared to act on your flood plan . -Prepare a flood kit of essential items. -Monitor local water levels , weather reports and the flood forecast on the Environment Agency website.
Symbol	Risk	Status	When it is used	What to do
	Very Low Risk	Warnings no longer in force No further flooding is currently expected in your area.	When river or sea conditions begin to return to normal.	-Be careful. Flood water may still be around for several days. -If you've been flooded, ring your insurance company as soon as possible.

3.3 Flood Management and Evacuation Procedures

The flood evacuation procedures are outlined in Table 11 below.

Table 11 – Flood Evacuation Procedures

Warning Trigger	Procedures
Flood Alert	<ul style="list-style-type: none"> Project Manager(s) to review FWEP Procedures – check procedures are still applicable.
Flood Warning	<ul style="list-style-type: none"> Site Agents to place staff on Green Alert, representing a state of readiness ahead of a potential flood event, via means of a daily briefing, by explaining the steps that will follow in the event of a Severe Flood Warning or Actual Flood Event. Site Agents to check that all equipment can be accessed, is available and in good condition for use, with specific reference to - closed road signs, torches (check battery life/spares), high visibility jackets for all staff. Site Agents to secure construction compounds and relocate vulnerable plant, machinery, fuel tanks, COSHH and stores off site outside of the flood warning area. Site Agents to check staff registers are complete and available to ensure all staff are accounted for post-evacuation. Site Agents to review flood wall monitoring data.

Severe Flood Warning	<ul style="list-style-type: none"> • Site Agents to immediately prepare for an evacuation of the potentially affected work sites. • Site Agents to arrange for the removal all non-essential personnel, plant, fuel, COSHH and materials from site. • Site Agents to direct staff not required for any essential activities to leave site and return home or to their place of rest. • Site Agents to contact the Emergency Services and Environment Agency to confirm that evacuation preparations are being undertaken due to possible risk of flooding. • Site Agents to operate the emergency electrical shut off switches terminating the electricity supply and all power supplies to construction works sites ensuring isolating supplies will not risk safety critical systems. • Site Agents to review flood wall monitoring data.
Actual Flood Event/River Wall Breach	<ul style="list-style-type: none"> • Site Agents to activate available site alarms, e.g. non-powered klaxon, to notify site staff of an immediate need to evacuate site. • Site Agents to operate the emergency electrical shut off switches terminating the electricity supply and all power supplies to construction works sites ensuring isolating supplies will not risk safety critical systems. • Site Agents to commence site evacuation and use allocated evacuation routes to facilitate / direct the safe evacuation of all personnel. • Site Agents to take a register to ensure all staff are accounted for. • Site Agents to notify Emergency Services.

3.4 Indicative Flood Sequence and Timings

Flooding is very complex and is controlled by a large number of highly variable physical factors, such as the volume and intensity of rainfall, wave heights and surge. Bespoke breach modelling, as described in Section 1.4, was undertaken to simulate flood conditions resulting from a failure of both the northern and southern defences and the model results have been used to estimate how much time it takes for floodwater to flow from the breach sites to the STT boundary. This information is summarised in Table 12.

Table 12 – Summary of Flood Timings

Modelled Scenario	Time for floodwater to reach land within the application boundary
Northern portal, 2005 0.5% AEP flood event	No flooding is predicted
Northern portal, 2065, 0.5% AEP flood event	1 hour and 30 minutes
Northern portal, 2115, 0.5% AEP flood event	45 minutes
Southern portal, Breach location 1 2005, 0.5% AEP flood event	No flooding is predicted
Southern portal, Breach location 1 2065, 0.5% AEP flood event	12 hours
Southern portal, Breach location 1 2115, 0.5% AEP flood events	12 hours
Southern portal, Breach location 2 2005, 0.5% AEP flood event	No flooding is predicted

Southern portal, Breach location 2 2065, 0.5% AEP flood event	6 hours
Southern portal, Breach location 2 2115, 0.5% AEP flood event	6 hours

3.5 Evacuation Point and Route

The evacuation point for each site is shown in Table 13 below. These locations are in Flood Zone 1 and will be reviewed for suitability on a frequent basis before and during the construction phase. The evacuation points shall only be used if the site is affected by a sudden, severe flood event such that flood waters have entered site.

In any other circumstances where both a Severe Flood Warning has been received from the Environment Agency and flood wall monitoring equipment has signalled a significant movement, above thresholds agreed with the Environment Agency, will a coordinated evacuation of site take place over a period of 24-48 hours and all site personnel will be directed to evacuate site and return to their home/place of rest.

Table 103 – Designated Evacuation Points

Northern Portal Evacuation Point:	Settle Point Car Park, London Rd, Plaistow, London, E13 0DX – see Appendix B for pedestrian route. Adjacent to Plaistow Underground Station.
Southern Portal Evacuation Point:	Westcombe Park Station Car Park, Station Crescent, Westcombe Park, SE10 7DX – see Appendix C for pedestrian route.

3.6 Water Level Falling

As detailed, the Environment Agency Flood Warnings identify a ‘potential’ rather than ‘actual’ threat. It should be noted that not all events would result in an automatic progression from one warning to another with the end-result being flooding and evacuation of the site. It is possible for smaller events to trigger initial warnings with water levels subsequently falling before flooding of the site occurs.

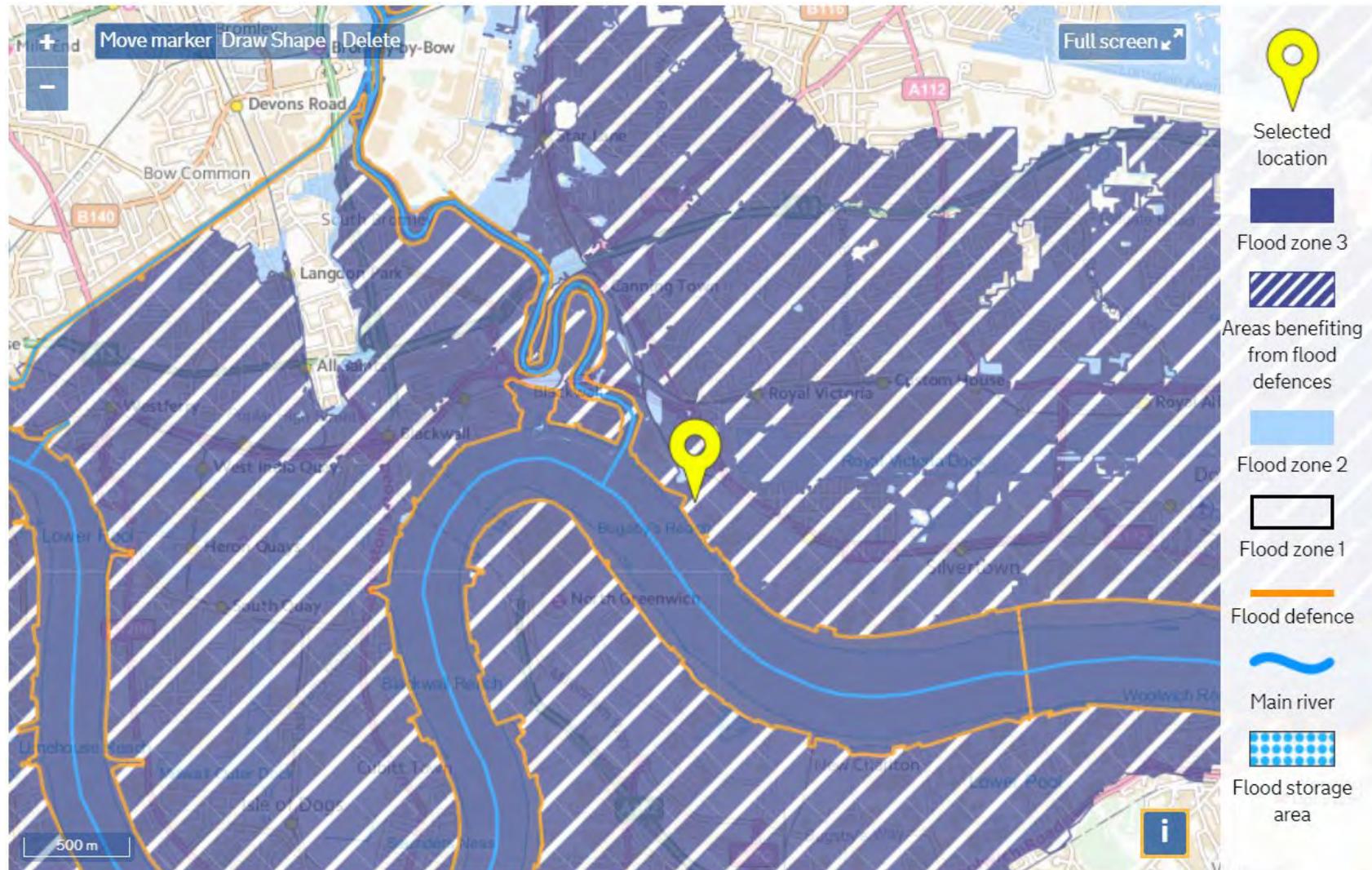
Should water levels within the Thames Estuary exhibit a sustained fall at any point during the event, this would be identified by the River Level monitors and an automatic notification sent via the Environment Agency Flood Warnings systems. With notification that the river level is falling the relevant Project Manager can downgrade the response to Green Alert at the Scheme.

4. Flood Warning and Evacuation Plan Review

4.1 Review

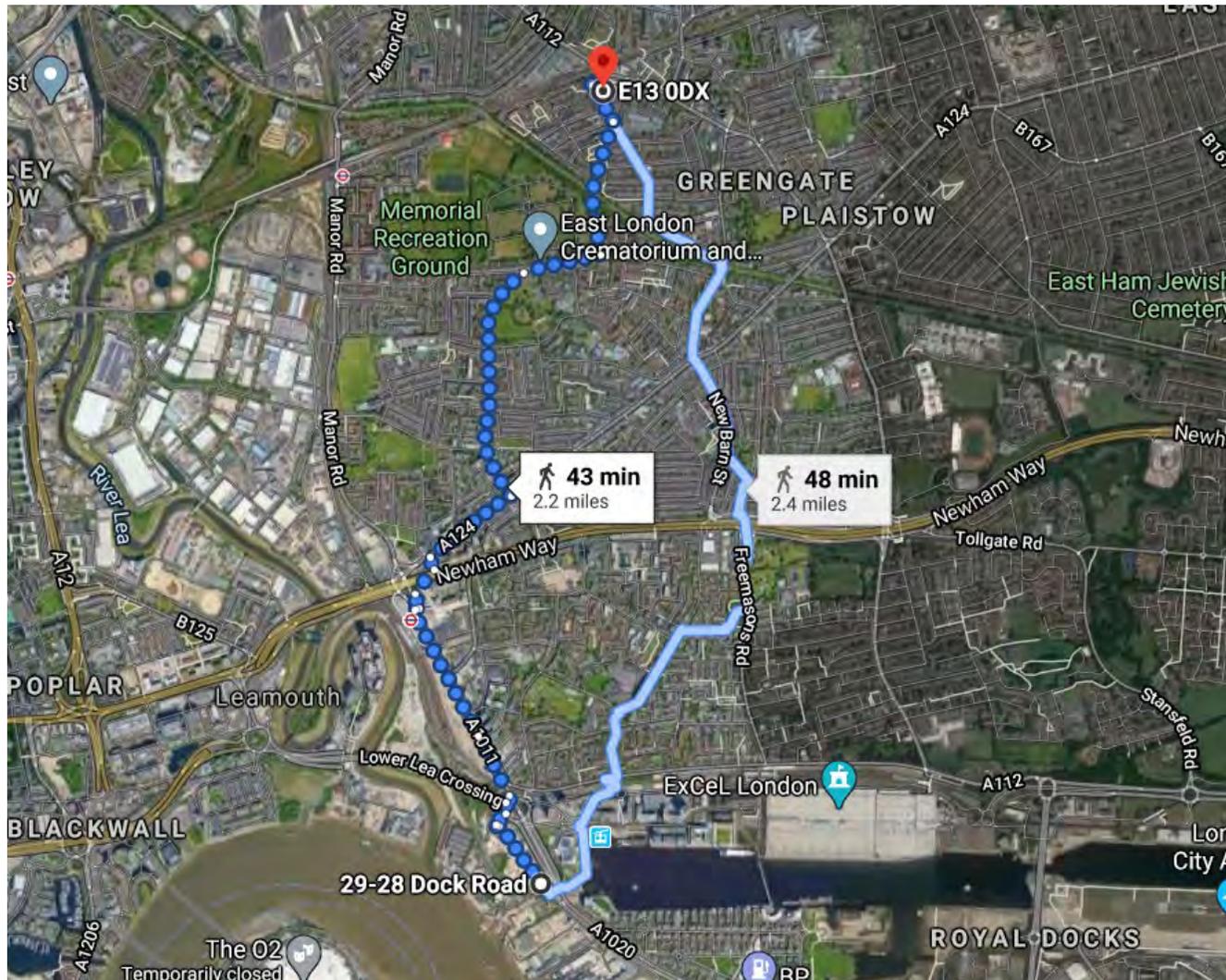
The FWEP would be subject to update / review whenever there are key changes to the details held within it. It shall be reviewed at least every six months, All updates / reviews shall be documented in the Issue and Revision Control page at the front of the document and reference must be made to reason behind the update to the plan. Project Managers will ensure that an up-to-date version of the FWEP is always available on site .

Appendix A – Flood Zones around STT



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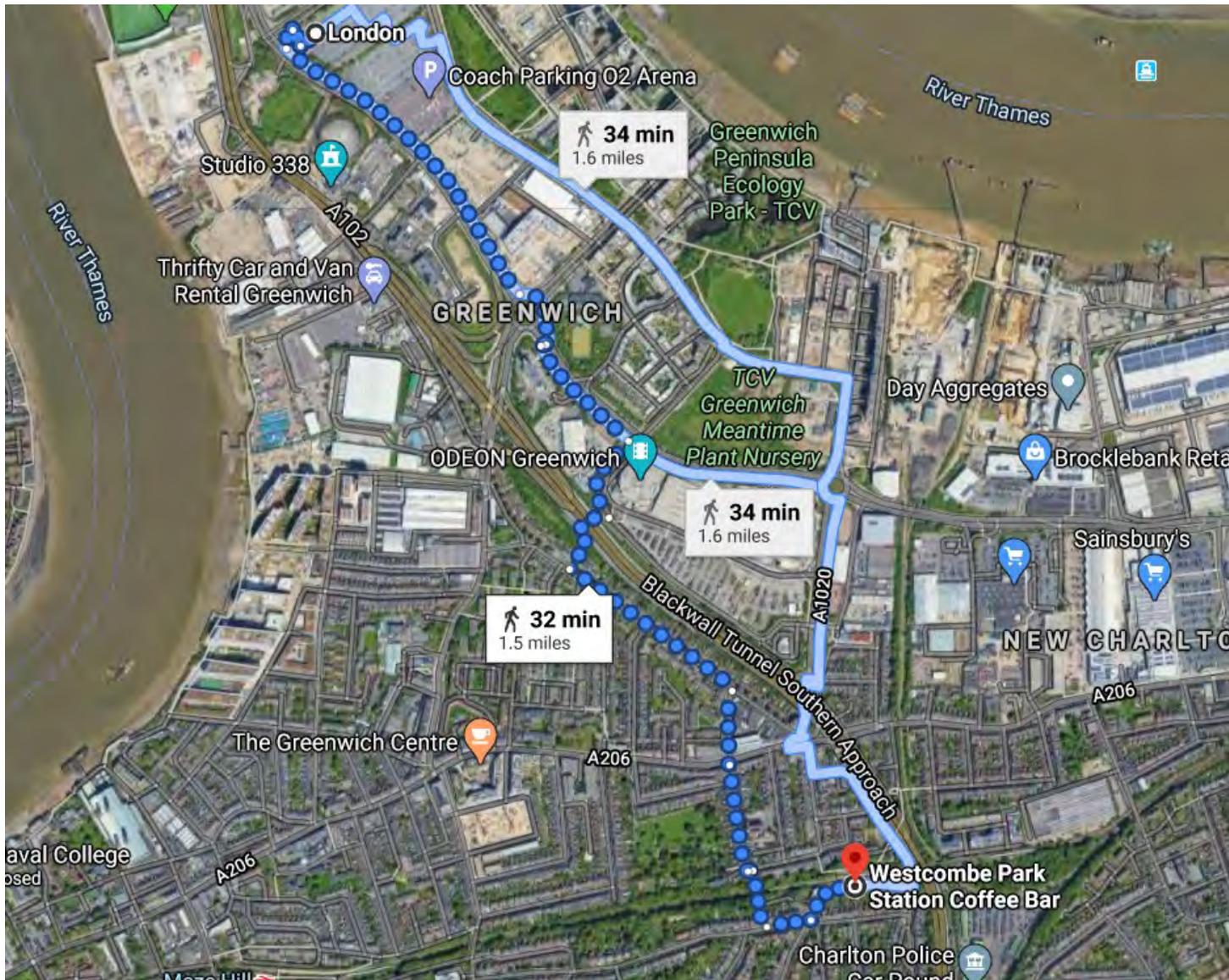
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